

PALPATION OF THE THORAX.

THE phenomena discoverable by palpation, with the exception of those elicited in the examination of painful spots, do not belong exclusively to this method, most of them being recognisable also by means of auscultation and percussion. Palpation is therefore most commonly resorted to merely as a means of confirming or modifying the results of other methods of examination.

1. MOVEMENTS OF THE THORAX.

The movements of the chest in inspiration may be as accurately ascertained by palpation as by inspection and mensuration. The palmar surfaces of the hands should be placed on the sides or on the anterior and posterior surfaces of the chest according as we wish to observe its lateral or antero-posterior movements; in this way even a very slight lagging-behind of one or other side is easily detected, frequently more readily than by inspection.

2. EXAMINATION OF PAINFUL REGIONS.

The seat of a painful sensation is often very vaguely indicated by the patient and can usually be determined with accuracy only by the application of the finger. Pain arising from *affections of the bones* forming the framework of the thorax, such as periostitis of the ribs, is aggravated by pressure. *Pleuritic* pain, which may quite escape the notice of the patient if the irritation of the pleura be not very intense, is frequently elicited only by pressure in one or more intercostal spaces and is always thereby considerably augmented; deep inspiration and forcible expiration, as in coughing, produce the same results. Pain in the intercostal nerves, *intercostal neuralgia*, is similarly increased by pressure. The pain of pleurisy may be distinguished from that of intercostal neuralgia by the fact that in the latter it generally extends along the whole course of the nerve in the intercostal space or becomes peculiarly acute on exercising pressure at certain spots ("painful points.") Pain in the muscles of the thorax, *muscular rheumatism*, is invariably aggravated by compressing the muscles between the fingers in a

direction transverse to that of their fibres; occasionally it is felt only when this is done, and it is further never so perfectly localised as the pain of pleurisy or neuralgia. Patients sometimes complain of undefined uneasy sensations in the chest which it is impossible to trace clearly to any of the above-named causes; these are most probably propagated from some organ or nerve situated in the immediate neighbourhood.

3. PECTORAL (OR VOCAL) FREMITUS.

By this term is designated a vibration of the walls of the thorax felt whilst *speaking*, singing, or screaming, by placing the hands on the chest. The vocal cords, thrown into vibration by the expiratory current of air, transmit these vibrations to the whole column of air in the bronchi and, if there be no special obstacle in the way, to the walls of the bronchi and through them to the thoracic parietes. The *intensity of the pectoral fremitus* depends, apart from the mere strength of the voice, on the following conditions: 1st, *On the pitch of the voice*; the vibrations of the vocal cords in the production of a low-pitched tone being necessarily *larger* than those concerned in the production of a tone of high pitch, the sonorous wave is carried outwards with greater force; just as in musical (stringed) instruments the vibrations of the lower strings are much more perceptible than those of the upper strings, being fewer in number in a given time, so in the human voice difference in tone gives rise to variety in the strength of the vocal fremitus, the latter being more marked in men than in women, most distinct in those having bass voices, and most feeble in high sopranos. 2ndly, *On the diameter of the bronchus into which the vocal vibrations are conducted, and its position relatively to the thoracic wall*; it is most intense therefore on the right side, the right principal bronchus being wider, joined to the trachea at a less acute angle, and situated nearer to the vertebral column than the left, which is also separated from the spine by the œsophagus and the aorta. 3rdly, *On the magnitude of the resistance offered to the passage of the sonorous vibrations through the walls of the chest*; the vocal thrill will therefore be most perceptible in patients in whom the subcutaneous fat is scanty and the muscular system but slightly developed. 4thly, *On the distance of the spot under examination from the larynx*; the fremitus is strongest over the larynx, is distinctly appreciable in the upper parts of the

chest (in the clavicular regions in front, and between the shoulder-blades behind), and diminishes in force inferiorly.

Under certain *pathological* conditions the pectoral fremitus is *diminished* or even abolished, at other times it is *increased*, these modifications being rarely bilateral, usually confined to one side, and extending over a greater or less area of the chest-wall.

It is *diminished* by the effusion of a large quantity of fluid into one side of the chest, and *disappears* entirely when the exudation fills the cavity of the pleura and causes complete collapse of the lung. In the latter case the total suppression of the fremitus is obviously due to the fact that the vocal vibrations are but feebly conducted through the compressed bronchi and are still further weakened and diffused in the mass of the fluid effusion. The pleuritic exudation here checks the sonorous waves, acting exactly like the damper of stringed instruments, or the cloth covering which is placed on a tuning fork to deaden its sound.

Effusion which is small in amount, not encysted, limited to the lower and posterior part of the pleural sac, has little effect on the vocal fremitus; a decided diminution in its intensity takes place only when the thickness of the exudation reaches or exceeds $2\frac{1}{2}$ cmtr. In cases of double pleurisy with effusion, in which the quantity of fluid thrown out is usually small and occupies the lower and hinder part of the chest, the pectoral fremitus is slightly feebler on both sides.

Diminution of the vocal thrill in the lower and posterior part of the thorax is of great value as enabling us to distinguish between pleurisy and pneumonia in the inferior lobe of the lung when the other symptoms alone are not sufficiently pronounced to warrant an exact diagnosis; it clearly indicates the presence of the former affection, as in the latter the fremitus is never decreased but always increased.

In the stage of absorption of pleuritic exudation the pectoral fremitus, which had previously been abolished, becomes again perceptible. This sign is of considerable importance, as it may sometimes be observed when the other symptoms of absorption are still absent; more especially the level of the fluid may remain unaltered though absorption has gone on to a considerable extent, the mass of exudation being simply reduced in thickness and the resistance to the propagation of the vocal vibrations in that way lessened.

Similarly in pneumothorax the vocal fremitus disappears because the sonorous vibrations penetrate the lung with difficulty and are arrested in the gaseous medium interposed between the lung and the chest wall. A slight diminution of the thrill is frequently noticed when the bronchi are loaded with secretion from the mucous membrane, as in chronic bronchial catarrh, the cause here also being that the abundant secretion presents an obstacle to the entrance of the waves of sound into the air-passages; after free expectoration the fremitus returns.

When the parenchyma of the lung is consolidated by infiltration and so rendered void of air the pectoral fremitus is *increased*, the condensed lung-tissue being an excellent conductor of sound. In normal conditions the voice is heard only very faintly over the side of the chest, as the healthy lung, consisting, as it does, of non-homogeneous tissues,—air-spaces and fibrous septa,—offers continual interruption to the outward passage of the waves of sound; when, however, the lung is infiltrated and impermeable to air it becomes a firm, homogeneous body, and acquires a higher conducting power. Further, the vibrations emanating from the vocal cords, when transmitted to the bronchi of a condensed portion of lung, are concentrated, being prevented from entering the infiltrated alveoli; they must thus reach the surface of the thorax in an exaggerated form. But it does not invariably happen that the pectoral fremitus is increased when the pulmonary tissue is consolidated; that this may be the case it is necessary that the bronchus leading to the part of the lung involved be in free communication with the trachea; should this communication be interrupted, as by superabundant bronchial secretion, the fremitus completely disappears, but returns when the mucus is expelled by coughing. Amongst those diseases which cause condensation of the lung-tissue, that in which the vocal fremitus is most frequently and most markedly augmented is the stage of *hepatization in pneumonia*; here the impermeability and solidification of the parenchyma are most pronounced, both as regards intensity and extent. Condensation from other causes is generally less complete; and in certain cases (of caseous pneumonia for example) it is not unusual to find that the voice, from concomitant disease of the larynx, is very feeble even over the vocal cords, so that its vibrations are no longer conveyed with distinctness to the surface of the chest.

A second cause of increase of the pectoral fremitus is the existence of *cavities in the lung*, situated superficially. Since these cavities always contain air, communicate freely with a bronchus of large calibre, and are surrounded by dense walls, the sonorous vibrations have easy access to them and are increased in intensity by reflexion from their parietes. The propagation of these vibrations is also greatly facilitated by the fact that those morbid processes which determine excavation of the lungs, especially phthisis pulmonalis, are always accompanied by well-marked emaciation of the thoracic parietes.

Vocal vibrations transmitted to the surface are perceptible not only by palpation but also by auscultation; indeed it is by the latter means only that the finer degrees of difference are appreciable. (See "Bronchophony.")

4. PLEURAL FREMITUS,*

(friction-sound perceptible to the touch.)

During respiration the visceral and parietal layers of the pleuræ, which are constantly in contact in their whole extent, rub on each other, this action being the more forcible the deeper and stronger the inspiration. In health these movements give rise to no sound, as the pleural surfaces are everywhere perfectly smooth; when the latter, however, become roughened, as by the fibrinous inflammatory deposit so often met with in pleurisy, the respiratory movements are attended by friction recognizable both by the hand and by the ear. (The characters of the friction sound will be discussed in the chapter on Auscultation.)

This sign is seldom observed at the outset of an attack of pleurisy, but appears usually in the later stages, when the absorption of the fluid exudation has proceeded so far as to allow the surfaces of the pleuræ, now covered with a deposit of lymph, to come into direct contact; it may sometimes be felt during the whole of inspiration and expiration, but is commonly most intense at the end of inspiration. In many cases friction fremitus is of a dull grating character, and consists of a quick succession of detached sensations—peculiarities which may be best compared with the creaking noise produced by the bending of new leather. This jerky, non-continuous character

* This term commends itself chiefly on account of its shortness.

is due to the fact that even in circumscribed areas the roughened pleuræ do not touch each other at all points at the same time; but when inspiration is rapidly performed the individual vibrations that go to form the pleural fremitus follow each other very closely.—In another series of cases the gliding of the pleural surfaces over each other communicates to the finger the impression of *scraping* or *scratching*, or of merely the lightest *grazing*.—The intensity of the palpable fremitus depends on the amount of the inflammatory deposit and on the energy with which respiration is carried on. Very marked roughness produces usually a grating sensation, slight unevenness merely a sensation of scratching or rubbing; the former condition is much more easily detected by palpation than the latter. Pleural fremitus is increased by deep inspiration, and frequently also by pressing the finger deeply into the intercostal spaces so as to cause the costal and visceral pleuræ to bear more strongly against each other. Very often the patient is himself sensible of this feeling of friction, and is able to indicate to the examiner the exact seat of the affection. Friction thrill becomes weaker when the pleuræ become less rough, from fatty degeneration of the fibrinous exudation; it may also be greatly diminished, or even caused to disappear for a time, by repeated deep inspiration,—a circumstance often noticed in auscultation, and obviously owing to the surface of the pleuræ becoming smoother by being rubbed forcibly against each other; after a short period of quiet respiration the fremitus may again be felt. The area over which it is appreciable is variable in extent, being sometimes limited, at other times comparatively large; occasionally it extends over the greater part of one side of the chest, in front, behind, and laterally, and in the rare cases in which both pleuræ are involved (double pleurisy) it occurs on both sides. It may be stated as a rule that there is no part of the thorax in which this pleural fremitus may not present itself; it is observed most seldom in the apices, partly because pleuritic effusion so abundant as to reach the apex of the lung is somewhat rare, and also because the movements of the pleuræ on each other in respiration are here much less free than at other parts of the chest. Pleural fremitus limited to the apex, however, though it is very infrequent, may arise from absorption of effusion encysted in that situation by pleuritic adhesions; in other cases, in which the friction phenomena are perhaps better

detected by the ear than by the hand, the pleura becomes inflamed and covered by fibrinous deposit when the cheesy pneumonic process going on in the apex approaches sufficiently near to the surface of the lung. Pleural fremitus varies considerably in its duration; it sometimes remains only a few days at one part and then shifts to another according as the level of the fluid in the thorax alters, at other times it is fixed for a longer period at one spot; fremitus may thus persist for weeks or months according as the process of absorption is more or less prolonged. The differential diagnosis between pleural fremitus and other similar sensations connected with the respiratory apparatus is given below.

5. BRONCHIAL FREMITUS,

(vibrations caused by the movement of fluid secretion in the bronchi).

If the bronchial mucous membrane be extensively swollen, and the calibre of the bronchi in that way reduced, or if the air-passages be loaded with a very abundant fluid secretion, the entrance and exit of the current of air are obstructed; the bronchi are thus thrown into vibration and the fluid contained in them set in motion by the air as it passes through. The bronchial vibrations and the movements of the secretion are transmitted through the lung to the parietes of the chest, and these take the form of the fremitus under discussion, a very exact conception of the peculiar character of which may be obtained by applying the finger to a bass string which is vibrating powerfully.* As bronchial fremitus, when present, usually manifests itself over a large area, sometimes over the whole of the thorax—though possibly not with equal intensity at all points,—it is necessary, in order readily to ascertain its extent, to lay the palmar surfaces of both hands first on the back and front and then on the sides, directing the patient at the same time to make several deep inspirations. It may be of much the same intensity both with inspiration and with expiration, though occasionally it is more distinct with the latter,—a circumstance which is explained by the unusual slowness of expiration when the calibre of the

* I would recommend the term *bronchial fremitus* to designate the impression above described, especially as it presents an analogy with the expressions *pectoral fremitus* and *pleural fremitus*.

bronchi is reduced by widespread catarrhal swelling of the mucous membrane.

Bronchial fremitus is distinguished from pleural fremitus by the following points: it has none of the irregular, jerky character which marks the latter, in expiration it is as strong as, or even stronger than, in inspiration, and it may be temporarily diminished or even made to disappear by violent coughing, and especially by expectoration of mucus; in some other cases, in which the cough is unaccompanied by expectoration, the fremitus becomes weaker at certain parts of the chest but intensified at certain other parts,—a phenomenon which has its origin in the fact that forcible coughing displaces the fluid bronchial secretion and causes it to occupy less space than before. Pleural fremitus, on the other hand, is not at all modified by cough. (Various other diagnostic characters are revealed by auscultation, which see.)

Bronchial fremitus indicates the presence of *diffuse bronchial catarrh*. This agitation of the bronchial secretion is not only perceptible to the hand but is also audible, even at some distance from the patient, as a large bronchial r le. (See chapter on R les.)

It is usually one of the most prominent symptoms in the bronchial catarrh of young children, as the mucus secreted in that disease, from the inability of patients of tender years to expel it by the act of coughing, accumulates largely in the bronchi.—The part at which the fluid secretion has chiefly collected may be determined with a certain degree of probability by simple palpation, the fremitus being at such points rougher and of a more rattling character; an exact diagnosis, however, is attainable only by means of auscultation. (See chapter on R les.)

6. VIBRATIONS DEPENDENT ON THE MOVEMENTS OF FLUID SECRETION WITHIN PULMONARY CAVITIES.*

The agitation which is caused by the movements of respiration in the fluids contained in cavities in the lungs is communicated to the walls of the thorax, but only when these cavities are situated in the *upper lobe*, and near the surface of the lung, and when the chest itself is much *emaciated*. These vibrations differ markedly from those which have just been under consideration; they are feebler and finer, give the impression of the bursting of small bubbles, and are usually noticeable only at the end of inspiration, in the *upper part* of the chest in *front*, and

* [Cavernous Fremitus.—Trans.]

over a limited area. They are entirely wanting when the excavation has taken place in the lower lobe, as the thickness of the muscular covering in that region offers great resistance to their transmission. Cough, especially when followed by expectoration, weakens them very much, or abolishes them for a time. (See chapter on Râles.)

7. FLUCTUATION IN THE THORAX.

In cases of pleurisy in which the effusion is very considerable in quantity, almost completely filling one side of the chest, a feeling of fluctuation may sometimes be elicited by placing the palmar surface of one hand on the side or back of the thorax and tapping on the front with the finger of the other hand.

One might *a priori* expect to find fluctuation in such a case; occasionally, however, the rigidity of the thorax is such that the force imparted by the finger does not reach the fluid, or the chest-wall does not yield to the wave even when the fluid is set in motion. The presence of a thick covering of exudation on the pleuræ may also prevent the production of fluctuation,—a further consideration which also explains the comparative rarity of the phenomenon.

PERCUSSION OF THE THORAX.

HISTORICAL NOTE.

The discovery of thoracic percussion we owe to Auenbrugger, who was born at Gratz in 1722 and died at Vienna in 1809. When engaged in the study of empyema and the indications for the practice of thoracentesis he learned in 1753 to distinguish the healthy from the diseased side by the different sounds which they yielded to percussion. After having worked at this subject about seven years he published, in 1761, his "*Inventum novum ex percussione thoracis humani ut signo abstrusos interni pectoris morbos detegendi.*" Auenbrugger himself recognised the value of his new method of exploration in the diagnosis of diseases of the chest,—though he had no conception of the wide application it was to receive in our day,—and insisted on its importance in his "*Monitorium*" addressed to his fellow-physicians. It was, nevertheless, much neglected by them: to some it remained quite unknown, by many it was confounded with the Hippocratic *succussion* observed in pyopneumothorax and accordingly ridiculed as the "*Inventum novum antiquum*," while by others (van Swieten and de Haen) it was set aside as unworthy of serious consideration. It was only by a very few, the principal of whom was Stoll, that it was employed in practice; and when the latter died in 1787 the great discovery passed into utter oblivion. Not until 1808, shortly before Auenbrugger's death, did the "*Inventum novum*" become generally known to German physicians, through Corvisart's French translation. Corvisart extended the application of percussion to the diagnosis of cardiac diseases and aneurism of the aorta. But it is to Piorry and Skoda that the most important advances in the study and practice of percussion are due. The former invented the Pleximeter (in 1826), and was also the first to avail himself of percussion in the examination of the abdominal organs; the latter clearly traced the special qualities of the percussion-sounds to their general physical causes, he originated the doctrine on which all our notions regarding percussion in normal and pathological conditions are based, and added to our knowledge of the sounds that may be produced by striking on the thorax by his exhaustive researches on the subject of tympanicity (1839).

For many details concerning the interpretation of the various qualities of the percussion sounds we are indebted to Wintrich (tympanicity), Traube (the pitch of the sound), Biermer, Geigel, Wintrich, Gerhardt (variations in the pitch of tympanitic and amphoric sounds), and many others.

Wintrich invented the percussion-hammer in 1841.